EFFECTS OF WEAPONS PROCUREMENT STRETCH-OUTS ON COSTS AND SCHEDULES

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NOTES

Unless otherwise indicated, all years referred to in this report are fiscal years.

Details in the text and tables of this report may not add to totals because of rounding.

Unless otherwise indicated, all costs and budgetary detail are expressed in billions of constant fiscal year 1988 budget authority dollars. Calculations of additional costs or savings from altering specific procurement programs are expressed relative to the costs of those programs presented in the President's Department of Defense budget request for fiscal years 1988 and 1989 and supporting documents that accompany the budget request.

PREFACE

Despite significant efforts to reform the acquisition process, problems with buying weapons systems continue. This report, prepared by the Congressional Budget Office (CBO) at the request of the Senate Committee on Armed Services, focuses specifically on the pace of weapons production. Stretching out the process of acquiring new weapons not only adds to program costs but also limits efforts to equip U.S. forces with modern weapons. The report examines alternative procurement policies that would permit higher production rates while recognizing overall fiscal constraints on the defense budget. In accordance with CBO's mandate to provide objective analysis, the report makes no recommendations.

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SUMMARY

The Department of Defense (DoD) buys many weapons in annual quantities that are quite low, relative to total requirements. Buying proven weapons at low rates of production makes poor use of available industrial resources; it also adds to weapons costs, discourages potential suppliers, and delays the flow of new technology to the military forces. This long-standing tendency to stretch out procurement has persisted in the face of criticism from numerous authorities--including many in the higher echelons of the Department of Defense.

As long ago as 1981, DoD set a goal of increasing weapons procurement rates to economic levels. The Congress not only supported this, but in some cases increased procurement quantities for weapons when it felt the Administration's requests were inadequate. In recent defense budgets, however, new examples are appearing of procurement programs that have been stretched out because of budgetary limitations.

RECENT PRODUCTION-RATE TRENDS

So far, the Administration has achieved mixed results in its effort to speed weapons acquisition. In the 1983-1987 period, it succeeded in buying some classes of weapons systems--such as helicopters, tactical missiles, and transport and tanker aircraft--at higher rates than in the earlier five-year period from 1976 through 1980. Other classes of weapons, however--including strategic missiles and fixed-wing combat aircraft--were bought at lower rates than before.

By the standard of economic efficiency, the record has been uneven. This study uses DoD's own measure of economic efficiency, the minimum economic rate of production--defined as the lowest rate of production that offers an acceptable return on the investment in production facilities--to appraise DoD's success. Of the 40 weapons programs--including aircraft, missiles, and combat vehicles--reviewed in this study, exactly one-half were purchased at or above their minimum economic rate (on average) during the 1983-1987 period.

For the remaining 20 systems, average annual procurement rates were below--sometimes well below--the minimum economic level. Summary Table 1 shows selected examples of both groups of weapons.

The Army was more successful than the other services, according to this measure. Seventy percent of the Army systems that were reviewed had been purchased at or above the minimum economic rate. The comparable percentages for the other military departments were much lower: 44 percent for Air Force programs and 43 percent for those of the Navy.

The above comparisons might be misleading, since the services have not always been consistent in their definition of the minimum economic rate. But similar results were obtained using as a standard the maximum economic rate--the highest level of production that current facilities can support. Overall, 18 of the 40 systems were bought at 50 percent or more of their reported maximum rate. Again, the Army did best--9 out of 10 systems meeting this test--while only 33 percent of Navy programs and 22 percent of Air Force programs in the sample were bought at rates equal to or greater than 50 percent of the maximum economic rate.

Fiscal Year 1988 Procurement Cuts

Recent developments suggest that the problem of stretch-outs may worsen. Quantities requested in the fiscal year 1988 budget for 11 of the 20 largest weapons programs (excluding shipbuilding programs, which were not considered in this study) were reduced from those planned for 1988 in last year's budget. Only 2 of these 20 programs showed an increase in quantity from last year's estimate.

Congressional Changes in the 1988 Request

Concerned by these trends, both the Senate and House Armed Services Committees recommended increasing quantities of many weapons systems--including tanks, Army helicopters, and certain air-to-air missiles--to higher levels when they reported out their respective versions of the fiscal year 1988/1989 National Defense Autho-

SUMMARY TABLE 1. PRODUCTION RATES OF SELECTED WEAPONS

System	1983-1987 Procurement Rate a/ b/	Minimum Economic Rate	Maximum Economic Rate
Systems Bought at Higher than Minimum Economic Rate			
AH-64 Apache Helicopter	117	72	144
M1 Abrams Tank	825	720	1,080
Bradley Fighting Vehicle	647	540	792
Patriot Missile	485	240	840
Stinger Missile	3,539	1,800	11,520
F/A-18 Aircraft	84	84	145
Standard Missile 2 c/	848	840	1,324
Sparrow Missile d/	2,015	1,200	3,804
B-1B Bomber	31	24	48
C-5B Transport	15	4	24
F-16 Aircraft	155	108	324
Hellfire Missile d/	6,131	1,500	6,720
Multiple Launch Rocket System	50,822	36,000	72,000
F-14A Aircraft	21	12	96
KC-10 Tanker/Cargo Aircraft	9	8	24
Systems Bought Below Minimum Economic Rate			
AV-8B Aircraft	34	36	72
A-6E Aircraft	8	12	72
F-15 Aircraft	41	120	144
Ground Launched Cruise Missile	99	120	600
Harpoon Missile	284	360	660
MX Missile	17	21	48
P-3C Aircraft	8	16	24
Phoenix Missile	222	240	420
SH-60B LAMPS Helicopter	23 e/	24	60
Tomahawk Missile	186	300	540

SOURCE: Compiled by the Congressional Budget Office from Department of Defense, *Procurement Programs (P-1)*, various years.

a. Excludes initial two years of production.

b. Average over years within the 1983-1987 period when the system was actually procured.

c. Combined procurement of medium-range and extended-range versions.

d. Combined procurement of all services.

e. Includes seven SH-60F helicopters in 1987.

rization Act. To meet the overall defense spending limit imposed by the budget resolution, however, many of these increases were limited when the House bill reached the floor. In addition, production rates for other weapons systems--including the AH-1W helicopter for the Marine Corps, the AMRAAM (Advanced Medium Range Air-to-Air Missile), and the Imaging Infrared (IIR) Maverick missile--were reduced below the Administration's request by the House. The Senate bill passed without major changes in the Committee's recommended quantities. The conference agreement on the National Defense Authorization Act recommends increases for tanks, Army helicopters, EA-6B jammer aircraft, and Sidewinder and Sparrow missiles.

IMPLICATIONS OF STRETCH-OUTS

The major reason for stretching out acquisition programs is to meet fiscal limitations imposed by the annual budget cycle. The amount of total funding required in a given year takes precedence over economic considerations, even though buying larger quantities would reduce unit costs. Limitations on funding mean that unless a program is stretched out it may be necessary to cancel or defer other weapons programs.

Another consideration is that, in the past, increasing production of a state-of-the-art weapon to high rates too early has proved costly. DoD normally keeps production rates low until systems have been tested in the field, in order to identify and remedy defects before too many units are produced. In some cases where significant production began before all development work and operational testing had been completed, DoD has needed to spend considerable sums to remedy problems in weapons already delivered to field units. The B-1B bomber is a recent example.

Low production rates are sometimes chosen in preference to shutting down production altogether when a weapons acquisition program is nearly complete. This policy keeps the production facility in being as a hedge against the need to expand production to meet wartime requirements. It also facilitates the transition from one weapons system to its successor, when the same manufacturer produces both.

Nevertheless, there are important reasons to avoid stretching out weapons procurement. As noted above, producing weapons at rates consistent with the manufacturer's capacity tends to lower unit and total program costs. Estimates made by the military services suggest that a 50 percent decrease in the annual rate of production increases real unit costs of aircraft by 7 percent to 35 percent. Tactical missile programs are even more sensitive to production-rate reductions; their unit costs rise by 8 percent to 60 percent with a 50 percent decrease in the output rate. CBO's own statistical analysis found roughly comparable effects on unit cost for many, but not all, of these systems.

There are other compelling reasons to avoid stretch-outs. At current rates of acquisition, many weapons could become technically obsolete by the time significant numbers of them are deployed. For 26 major weapons it would take an average of 16 years from the time production began to fulfill DoD's acquisition objectives--assuming that production continued at currently planned rates. For 6 of these 26 systems, it would take 20 years or more to complete the programs. Of course, many of these systems have already been considerably modified, but there is a limit to the extent to which a design that is more than two decades old can be altered to keep up with changing requirements.

Higher production rates could also meet concerns expressed by theater commanders that their forces are short of the modern weapons needed to cope with an increasingly sophisticated Soviet capability. The commanders have repeatedly emphasized the need for more modern missiles and other precision-guided munitions. Yet the current Five-Year Defense Plan fails to meet DoD's goals for many of these items, partly because of production stretch-outs.

INCREASING PRODUCTION RATES FOR SELECTED PROGRAMS

Nearly 10 years ago, DoD's Defense Science Board--an advisory panel of civilian scientists and technical experts--identified the basic problem in weapons purchasing: the military services seek to develop and acquire too many different weapons simultaneously. When defense budgets are limited, the services too often choose to underfund

all of their programs rather than making the difficult decision to cancel or defer some of them.

An Alternative Procurement Plan

To illustrate this trade-off more concretely, the study selected 12 examples of systems for which rates could be increased without major new investment in production facilities. These examples include aircraft, missiles, and combat vehicles in procurement for all the military services. They were chosen in part by reviewing the testimony of theater commanders and focusing on those programs that seemed to have highest priority in their view.

For each of these 12 programs, an alternative procurement plan with higher production rates for the 1988-1992 period was developed and its cost estimated. Increases in production rates ranged from 19 percent to 127 percent. For 5 of the 12 systems, the alternative would buy the same total quantity already planned, but faster--completing the acquisition program for most of these systems by 1992 instead of by dates as late as 1998. For the remaining seven programs, higher rates would result in buying more weapons than the Administration currently indicates it plans to purchase, but not more than the services claim to need.

Adopting this alternative would require $24.5 billion in added funds for the five years 1988-1992 (see Summary Table 2). These additional funds would buy 1,263 more aircraft, 37,733 more guided missiles, and 3,109 more combat vehicles than the current Five-Year Defense Plan. The higher production rates would reduce unit costs of these weapons by from 2 percent to more then 20 percent, thus eventually lowering overall program costs--where quantities purchased are comparable--below those for the Administration's plan. For those five systems in which quantities would remain the same, savings in total cost were estimated at from 5 percent to 11 percent, depending on the source of the estimate.

SUMMARY TABLE 2. COSTS AND SAVINGS OF ALTERNATIVES TO THE ADMINISTRATION'S 1988-1992 PROCUREMENT PROGRAM
(In billions of fiscal year 1988 budget dollars)

Increased Budget Authority Needed to Increase Production Rates	
Five Aircraft Programs (AH-64, UH-60, SH-60, F-15, F/A-18)	15.1
Five Missile Programs (HARM, Harpoon, Maverick, STD 2, Stinger)	3.9
Two Combat Vehicle Programs (M1 Tank, Bradley Fighting Vehicle)	5.5
Total	24.5
Reductions in Budget Authority Associated with Deferring New Starts	
New R&D Programs	2.4
Eight Aircraft Programs (C-17, EX Competition, F-14D, JSTARS, P-3G, RC-12G, T-45TS, V-22)	16.9
Nine Missile Programs (Army Tactical Missile, FAADS Line of Sight-Forward-Heavy, FAADS Non Line of Sight, Penguin, Sea Lance, Tacit Rainbow, MX Rail Garrison, Small ICBM, SRAM II)	13.7
Two Ship Programs (LSD-41, SSN-21)	5.0
Three Other Programs (Fiscal Year 1989 Submarine Combat System, FAADS C^2, Sensor Fuzed Weapon)	1.2
Total	39.1
Savings in Budget Authority from Canceling Selected Programs	
Conventional Programs	
A-6F Attack Aircraft	5.1
Light Helicopter Experimental	3.1
F-15E Fighter Aircraft	8.5
V-22 Tilt-Rotor Aircraft	8.8
Subtotal	25.5
Strategic Programs	
Small Intercontinental Ballistic Missile	18.0
Rail Garrison MX Missile	8.4
Short Range Attack Missile II	1.2
Antisatellite Missile	2.5
Trident Backfit to Existing Submarines	0.8
Subtotal	30.9
Total	56.4

SOURCE: Estimated by the Congressional Budget Office from cost data reported in Department of Defense, *Selected Acquisition Report* (December 1986).

The Budgetary Trade-off

Since the alternative outlined above would impose higher near-term costs, the Congress would have to offset these additional costs through reductions elsewhere in the defense budget. Based on its responses to recent budget requests, the Congress would probably choose to reduce funding for other procurement programs rather than to cut funds that support current force operations.

It is impossible to assess the effect of such reductions without specifying what programs would be affected. Examples were chosen for the sake of illustration, using two distinctly different approaches. The first approach would defer new research and development (R&D) or production programs for two years. There are 9 new weapons programs for which R&D funds are under request and 22 for which procurement would begin in the Administration's 1988/1989 budget. Deferring all of these programs for two years would not reduce their ultimate costs but would reduce five-year budget authority by a total of $39.1 billion, much more than needed to finance the program of production-rate increases (see Summary Table 2). From these 31 programs, the Congress could select a smaller number to meet its overall fiscal constraint.

Alternatively, the Congress could choose to cancel--rather than defer--certain ongoing or newly proposed programs. Summary Table 2 lists examples of 4 conventional programs and 5 strategic programs that have previously been subjects of debate. Under Administration plans, these programs would require a total of $56.4 billion through fiscal year 1992. Again, it would not be necessary to cancel all of them in order to afford the program of production-rate increases described above. Canceling 4 conventional programs or 2 land-based ICBM systems would balance the additional costs for increasing production rates for the 12 programs.

These examples illustrate the trade-off DoD and the Congress face. With a limited total procurement budget, increased production of some weapons would probably mean postponing or forgoing procurement of others. The loss of capability from delaying future weapons or canceling some must be weighed against the advantages: getting current technology into the field more quickly and modernizing forces at a faster pace, while simultaneously reducing procurement costs.

CHAPTER I

INTRODUCTION

The Department of Defense (DoD) is the largest purchaser of military equipment in the free world. In fiscal years 1977 through 1986, the Congress authorized and appropriated a total of $248 billion for the procurement of aircraft, missiles, and combat vehicles--an average of nearly $25 billion a year. Notwithstanding these large sums, the pace of acquiring weapons systems often seems excessively slow. Acquisition schedules are routinely stretched out to fit programs into limited budgets. As a result, many weapons are being purchased at quite low annual rates. For instance, several aircraft are being produced at a rate of one or less per month, while there are instances of missiles being acquired at rates of less than one item per day.

Delaying or stretching out production of weapons by reducing annual quantities has several adverse implications for national security. Low production rates impede modernization efforts by delaying the provision of new, more capable weapons to U.S. forces in the field. They add to the total costs of weapons programs by preventing manufacturers from realizing economies of scale and introducing cost-saving manufacturing innovations. They also erode the defense industrial base because low annual purchases discourage potential suppliers of parts and components from competing for defense business.

Stretch-outs often occur because the military services seek to develop and acquire too many different weapons systems simultaneously.1/ Budget limitations then force program managers to cut their annual purchases to uneconomically low quantities. Innovations such as multiyear contracting and milestone budgeting can help to some degree to alleviate the adverse consequences of low produc-

1. Defense Science Board, *Report of the Acquisition Cycle Task Force* (Washington, D.C.: Office of the Under Secretary of Defense for Research and Engineering, 1978), p. 83.

tion rates, by allowing parts and components to be ordered in economical quantities.2/ But they cannot undo the basic inefficiency imposed on the prime contractor by an uneconomically low rate of annual production.

The United States produces far fewer weapons than its principal potential adversary, the Soviet Union. In the 10-year period from 1977 through 1986, for example, the U.S. military acquired 16,200 surface-to-air missiles as compared with 140,000 produced by the USSR. Over the same period, U.S. manu- facturers produced 3,450 fighter aircraft against 7,150 for the USSR, and 7,100 tanks as compared with 24,400 Soviet tanks.3/ While including production by the allies of the two powers would make these comparisons less one-sided, it would not reverse the Soviet bloc's superiority.

From a national security viewpoint, the United States may not be able to afford to continue producing fewer, more expensive weapons every year. As Lenin put it, "Quantity has a quality all its own." DoD and the Congress have a mutual interest in avoiding procurement program stretch-outs and low production rates for important items of military equipment needed to equip U.S. forces.

DoD'S ACQUISITION IMPROVEMENT PROGRAM

Upon assuming office in 1981, the leadership of the Department of Defense initiated a 32-point program to improve the way DoD buys weapons.4/ Among those 32 initiatives, several were designed to discourage stretch-outs and avoid uneconomically low production rates:

- Program stability--maintaining acquisition programs at planned schedules, quantities, and funding;

2. See Congressional Budget Office, *Assessing the Effectiveness of Milestone Budgeting* (July 1987), for an extensive discussion of these approaches.

3. Department of Defense, *Soviet Military Power 1987*, p. 21.

4. A thirty-third point--strengthening the defense industrial base--was added in 1984.

- Multiyear procurement--contracting for more than one year's deliveries at a time;
- Budgeting to most likely cost; and
- Buying weapons systems at economic production rates.

The Defense Acquisition Improvement Program (DAIP) has improved the acquisition process, but has not met all its goals, according to the General Accounting Office (GAO).5/ In its report, GAO noted that implementation of 23 of the 33 initiatives was less than complete. Furthermore, program managers surveyed by the GAO characterized their programs as unstable more often in 1985 than at the beginning of fiscal year 1983.

Nevertheless, the four initiatives listed above were among those targeted for high-level management attention in 1983. Thus, it is reasonable to expect that positive results might now be visible. Chapter II assesses production rate trends in more detail.

CONGRESSIONAL ACTIONS TO DISCOURAGE STRETCH-OUTS

Members of the Senate and House Armed Services Committees, concerned with low production rates, have taken steps to encourage the services to maintain their planned rates of production. These steps have included reversing DoD decisions to reduce rates during budget reviews. Often, however, these efforts have given way to pressure to reduce total defense spending. The Congress has even originated stretch-outs in some programs.

Reporting Requirements

One way for the Congress to focus attention on the production-rate issue is to require regular reporting to identify production-rate

5. General Accounting Office, *DoD's Defense Acquisition Program: A Status Report*, NSIAD-86-148 (July 1986), p. 13.

reductions. The Department of Defense Authorization Act for fiscal year 1986 required that information on actual and planned production rates be submitted in DoD's key reports on major weapons programs--the Selected Acquisition Reports (SARs). Major systems acquisition programs that are subject to the SAR requirements must report four sets of rates:

- The production rates assumed in the cost-effectiveness analysis used to support the decision to begin full-scale development;
- The rates incorporated in the production baseline estimate--defined as the rates assumed when the decision was made to proceed with production;
- The rates currently planned; and
- The maximum production rate(s) with current facilities and tooling.

In addition, the program office must estimate and report the cost impact of producing according to the current plan instead of the original production estimate, as well as the change in program completion date because of altered rates. These data provide the basis for much of the analysis in this report.

Congressional Revisions of the Budget

On several occasions, the authorizing committees have also acted to increase production rates for major weapons. The House Armed Services Committee recommended several such changes in the Administration's budget request for fiscal year 1988. Among the more significant of these House Committee changes were the addition of 120 M1 tanks (raising the annual quantity to 720), 18 Apache attack helicopters (leading to an annual buy of 85), 23 UH-60 Black Hawk helicopters (for a total of 84), and 6 EA-6B aircraft (raising procurement to 12). The rate of KC-135R tanker conversions was